

**San Francisco-Oakland Bay Bridge  
Annual BCDC Commission Presentation  
2016 Report: Piers E4 and E5 Implosion Results**



June 1, 2017


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EAST SPAN SEISMIC SAFETY PROJECT
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## Our Partners

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**Partner Recognition**

U.S. Department of Transportation  
Federal Highway Administration

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**CTF** Recognize • Remember • Educate

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**SFOBB Dismantling Contracts**

**YBITS 2 Contract**      **504/288 Contract**

**Marine Foundation Contract**

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## SFOBB Marine Foundations

- Pier E3
  - November 14, 2015
  - 5.3 Seconds
- Pier E5
  - October 15, 2016
  - 2.6 seconds
- Pier E4
  - October 29, 2016
  - 3.6 seconds

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## Pier Retention

- Five piers in-water under consideration: Pier E2, Piers E19-E22
- One pier in the intertidal zone: Pier E23
- Advanced Planning Study in development

**Pier E2**

**Pier E2**

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## Pier Retention: Piers E19-E23

E19

E20

E21

E22

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## Avoidance and Minimization Measures

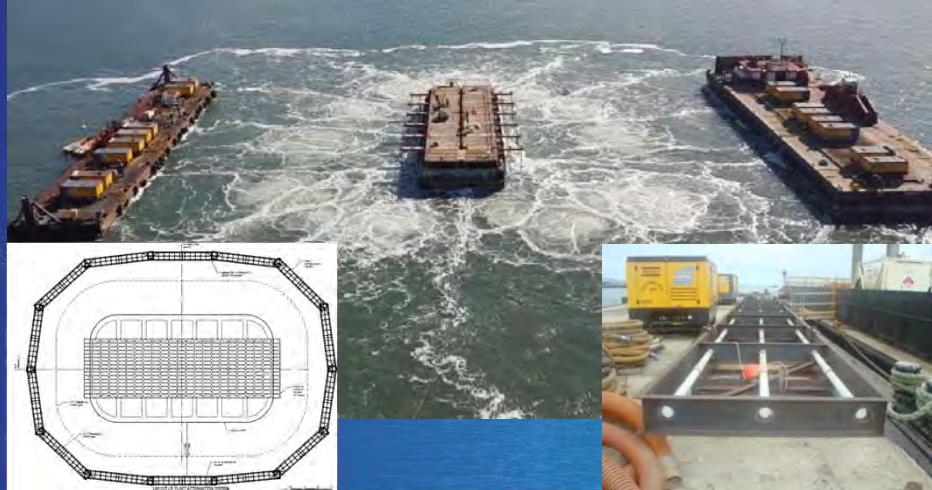
- Seasonal Avoidance
  - September 1 to November 30
- Blast Attenuation System (BAS)
- Blast Plan Design
- Bird Deterrence
- Monitoring



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## Blast Attenuation System



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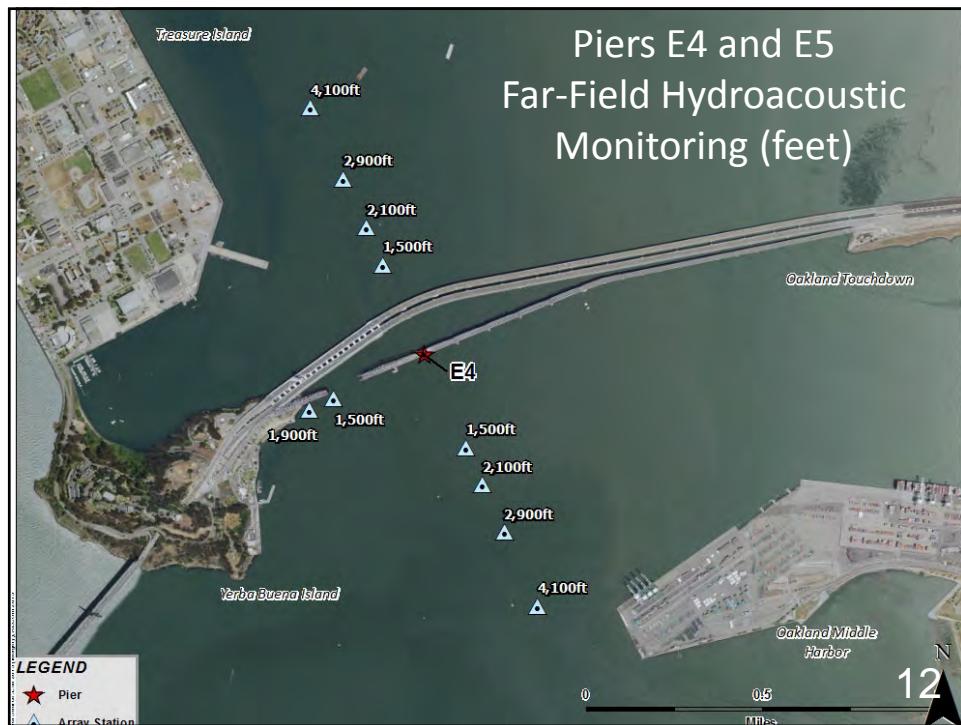
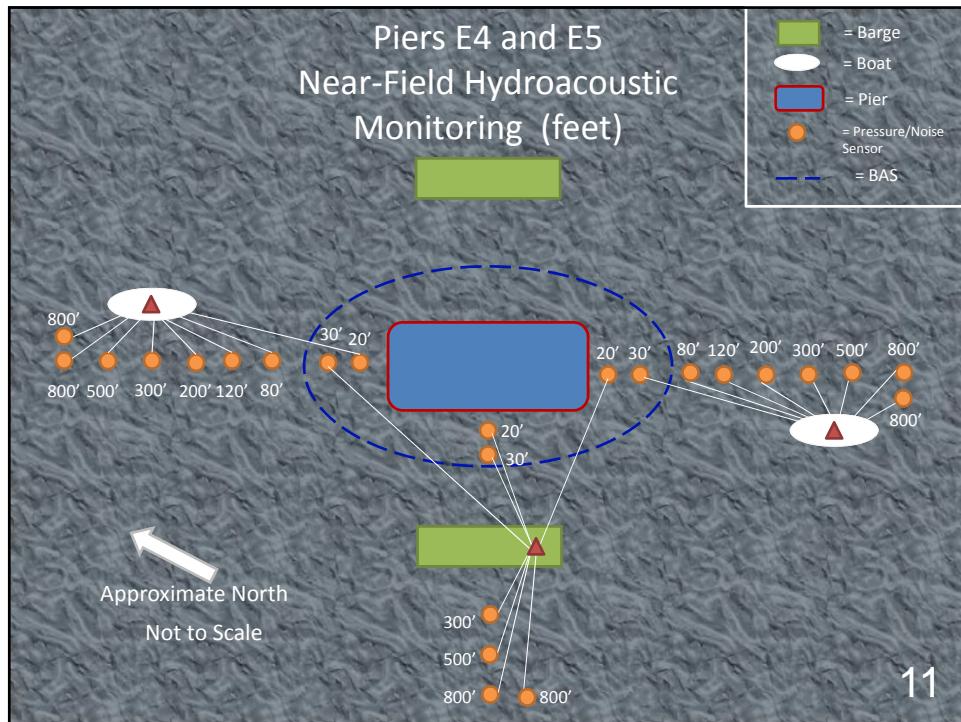
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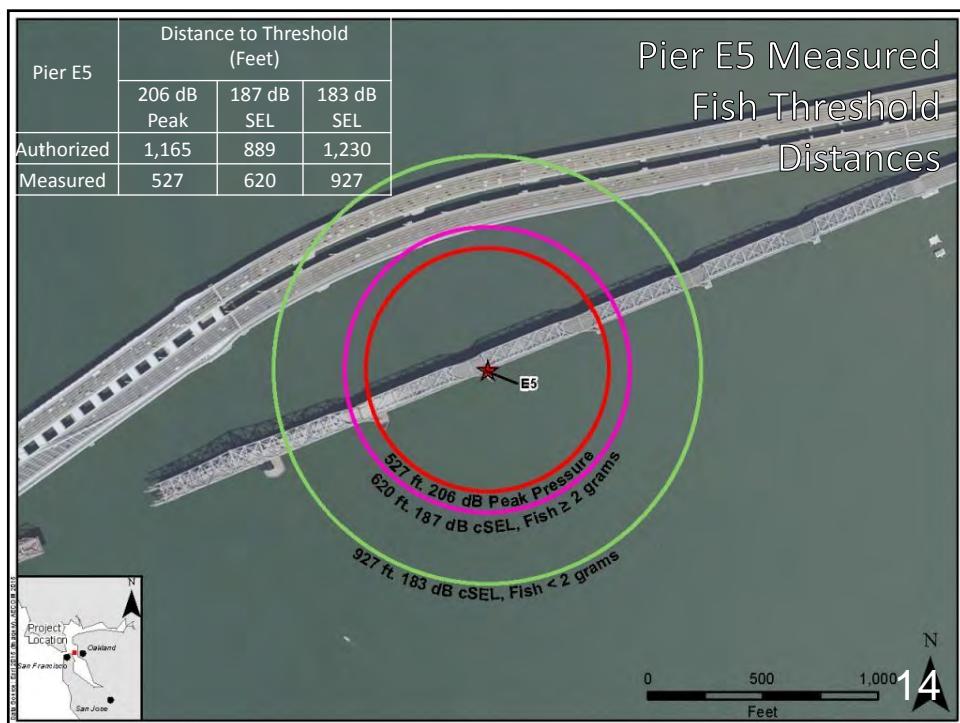
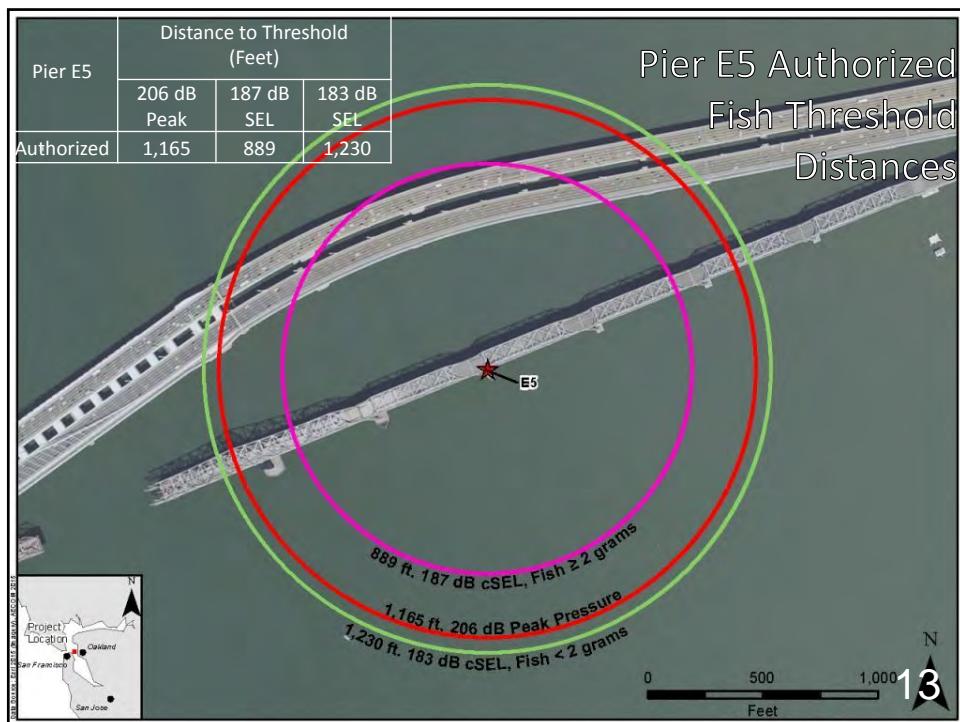
## Pier Implosion Monitoring Results

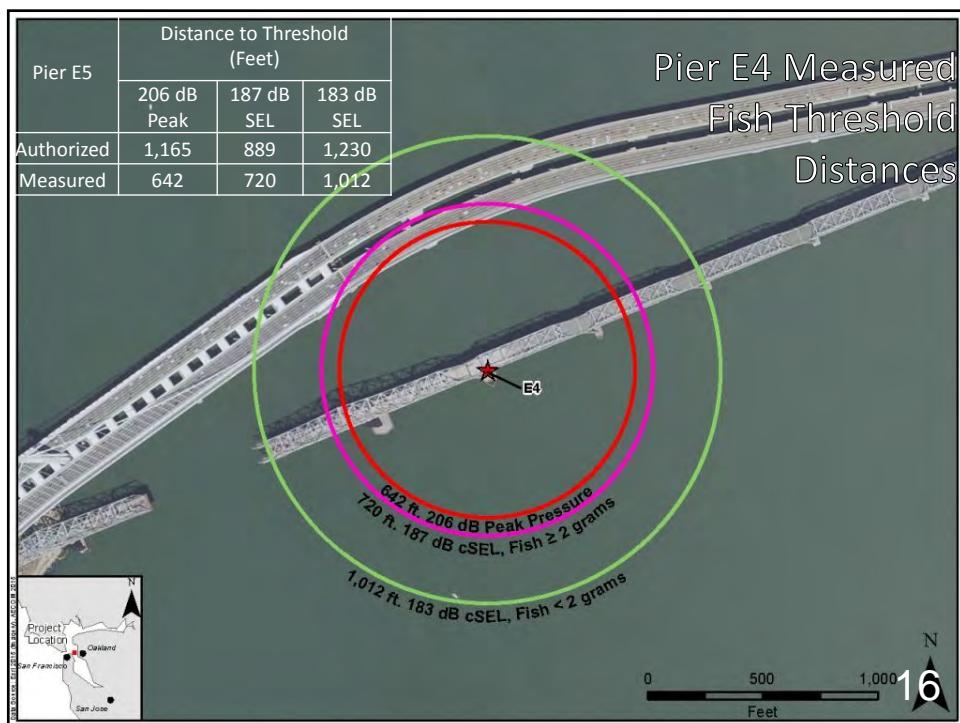
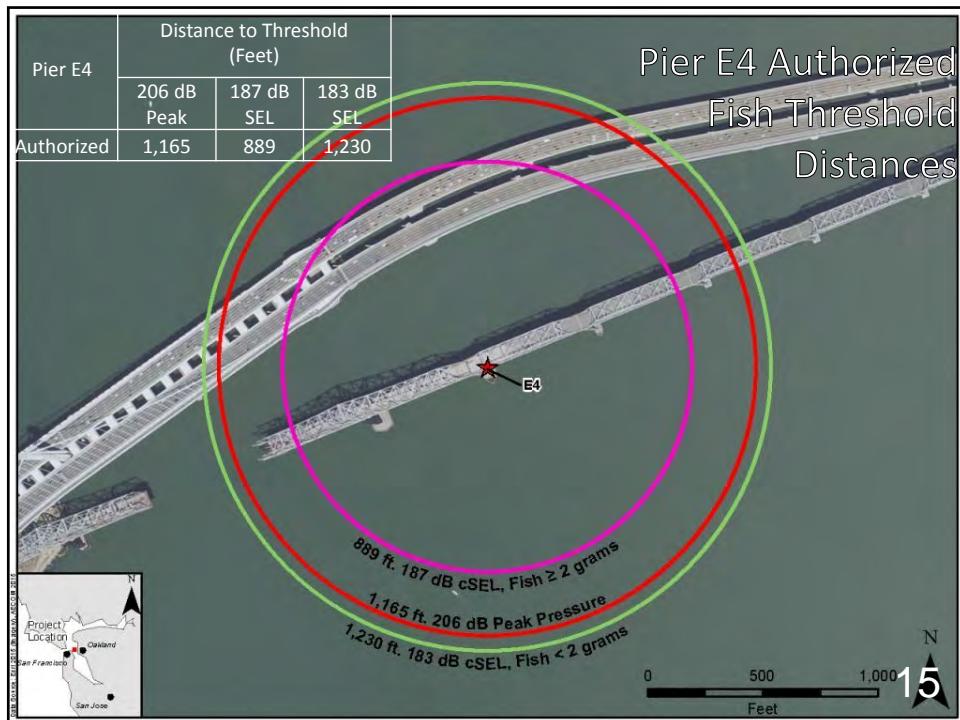


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## Fisheries Monitoring

- Pre-Blast Sonar
  - Data points observed in the areas around both piers, morning prior to blasts
  - Data points may correspond to pelagic (open water) schooling fish
- Fish Salvage - ~200 fish collected after each blast
  - Improved methods and protocol for collection from Pier E3
  - No listed species, no managed fish species
  - All rockfish and surf perch collected – structure oriented species
- Bird Predation
  - Bird predation (bird strikes) was minimal



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## Caged Fish Study Findings

- 600 fish per event; 120 feet to 800 feet; at 4 locations; plus control groups
- Only 2 fish out of 1,200 fish necropsied showed potential barotrauma-related injury (0.2% injury rate)
- All the deployed cages were within the area where sound exposure levels exceeded the regulatory thresholds for fish



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## Marine Mammals Monitoring

- 10 NOAA-approved Observers
- Implemented 15-min delay for a harbor seal during Pier E4 event
- Stranding team on site
  - Marine Mammal Center
  - 3-day post blast stranding surveys
- No injuries to marine mammals
  - Authorized harassment of 4 individuals; below the total number authorized in permit



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## Avian Monitoring

- No listed bird species observed diving at time of blasts
- No take of avian species
- Audio deterrents were effective



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## Water Quality Monitoring

- Monitoring:
  - Plume Mapping And Dynamic Monitoring (pH, turbidity, temp, DO)
  - Monitor Eelgrass Beds: TI, YBI, OTD, Alameda
  - Benthic Sediment Assessment Pre & Post Implosion



Drogues track the plume



Sondes measure pH, turbidity, DO, Temp



Monitoring buoys verify ESA (eelgrass) impact



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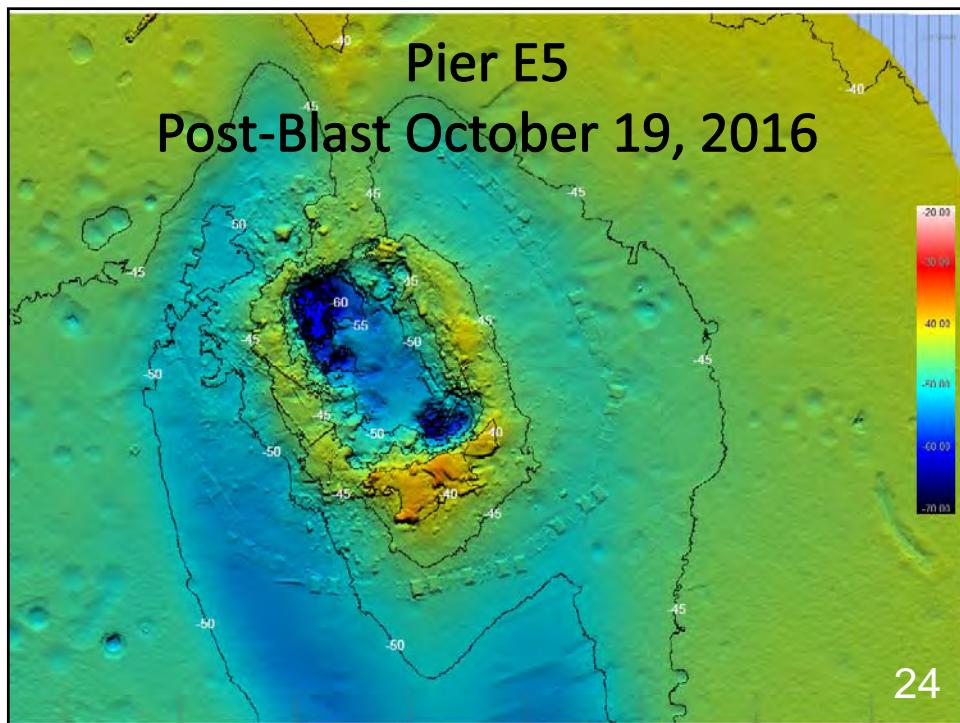
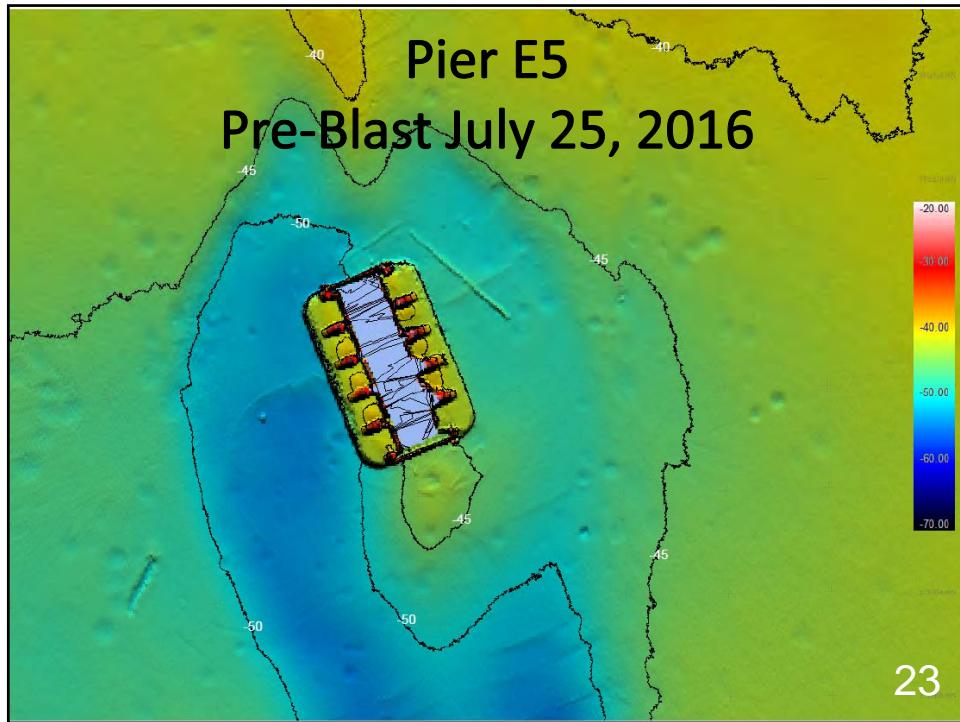
## Water Quality Monitoring Results

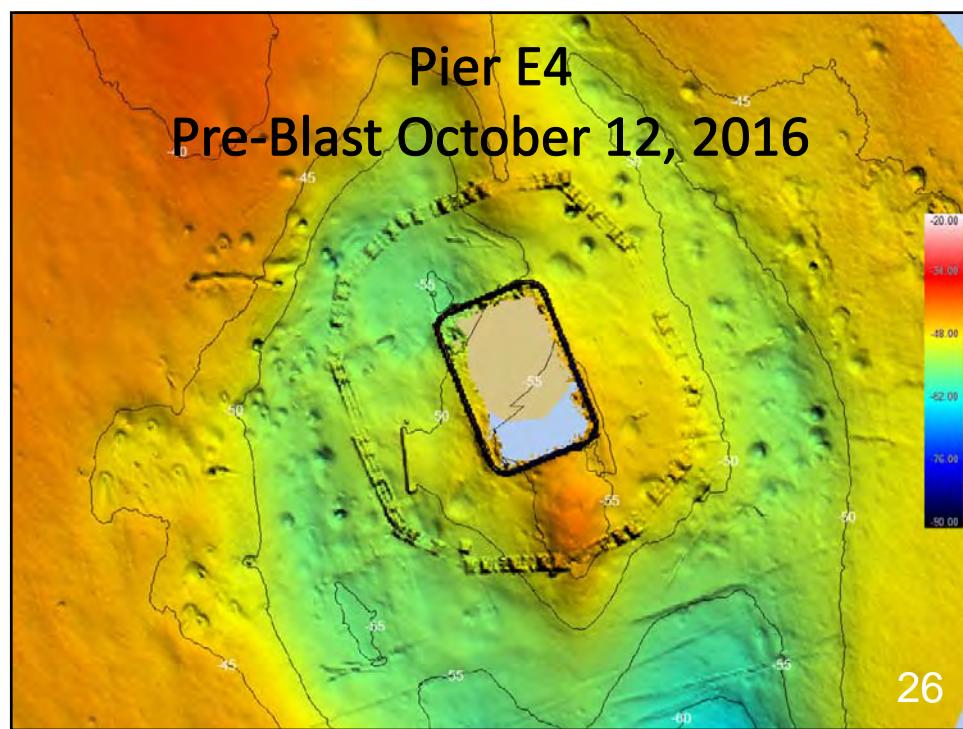
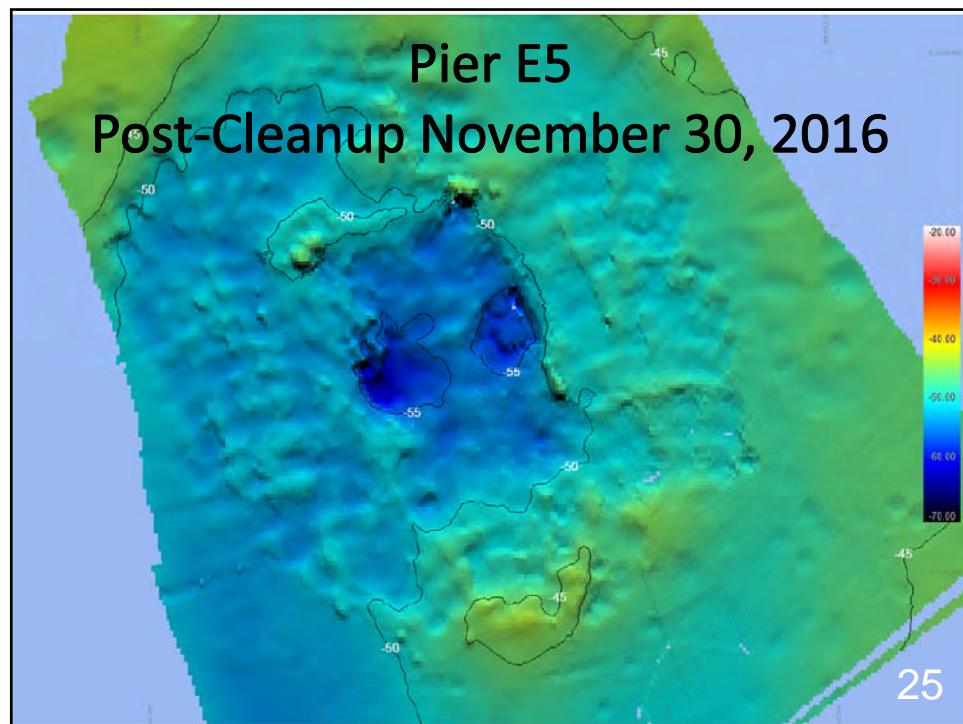
- Slight increase background pH next to the piers
  - Attained water quality objective within 30 minutes
  - Returned to background within 3 hours
- Small to no observable change in turbidity
- Results consistent with water quality model
- No difference in benthic sediment toxicity: pre/post implosion
- No impacts to eelgrass due to implosions

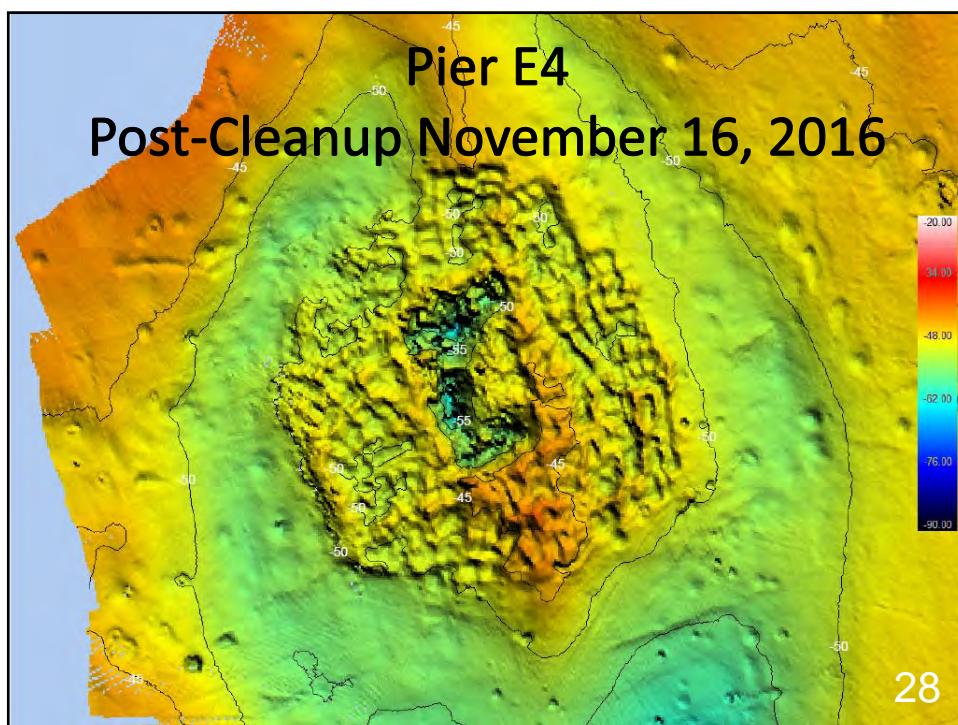
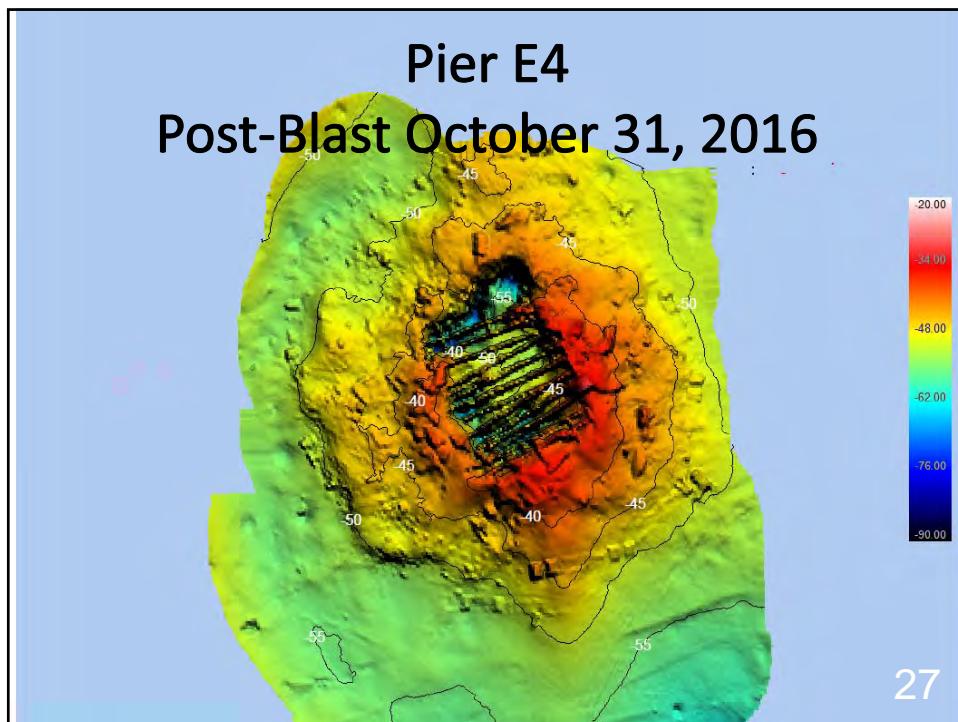


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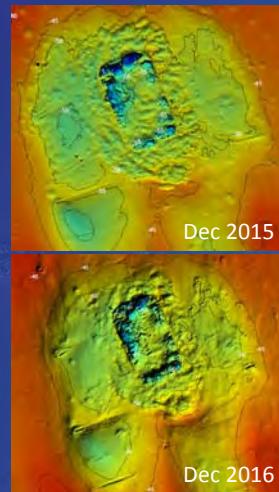
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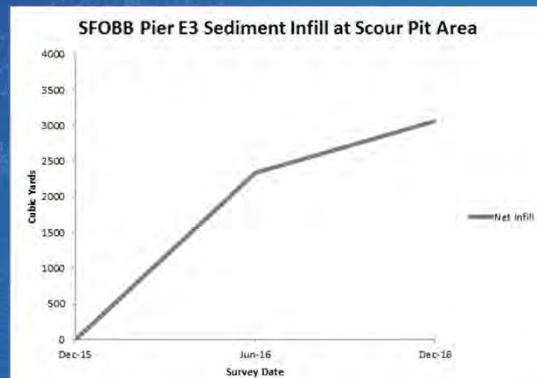




## 2016 Pier E3 Infill Monitoring



- Data shows Pier E3 scour area is naturally filling in with sediment
- ~3,100 cubic yards of net infill



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## Implosion Video – Pier E4



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## Dismantling Status

- 504/288 superstructure removed
- All marine foundations available for demolition



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## Early Completion

Methods to Accomplish Goal:

- Multiple pier events
  - Combine 2-4 smaller piers into single blasting events
  - Implose 13 piers in the 2017 season
- Extend post-blast clean-up window to December 31<sup>st</sup>

No New or Increased Impacts

- All blast events will use less explosives than Pier E3
- Impacts will remain within authorized parameters



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